50X1-HUM

CLASSIFICATION CONFIDENTIAL CONFIDENTIAL

CENTRAL INTELLIGENCE AGENCY
INFORMATION FROM
FOREIGN DOCUMENTS OR RADIO BROADCASTS

REPORT

CD NO.

COUNTRY	USSR	DATE OF INFORMATION	1947
SUBJECT	Economic; Technological - Chemical industry		
HOW PUBLISHED	Monthly Periodical	DATE DIST.	28 Feb 1950
WHERE PUBLISHED	Moscow	NO. OF PAGES	3
DATE PUBLISHED	Feb 19		
LANGUAGE	Russian	SUPPLEMENT TO REPORT NO.	

THIS IS UNEVALUATED INFORMATION

SOURCE "Khimicheskaya Promyshlennost'" No 2, 1947.

PRODUCTIVITY OF A SODA-PLANT UNIT FROM THE STANDPOINT OF RESISTANCE TO GAS FLOW

Engr A. D. Kron

Ninety five percent of the world production of soda takes place according to the ammonia-soda or Solvay process. There is no doubt that this process will predominate during the next few years. An absorption and distillation unit at an ammonia-soda plant consists of the following equipment units, through which the gas flows in the order indicated below: still, reheater, condenser of the reheater, cooler of the reheater, first absorber, second absorber, scrubber of gas coming from absorber, and absorption system vacuum pump. It is evident that the productivity of a unit of this type, and of the soda plant as a whole, depends on the efficient flow of gas, an element of cardinal importance which has been neglected somewhat in favor of studies of the flow of liquid through this equipment.

It is generally assumed that the still has a decisive effect on the productivity of a soda-plant unit, because the still carries the heaviest load of both liquid and gas flow. Improvements of the design and operation of the still may raise the productivity to a marked extent. For instance, at the Donetz Soda Plant reduction of the depth of bubbling /slot submergence?/ combined with an increase in the cross section of the vapor outlets has reduced the resistance of the still to gas flow, thereby improving the efficiency.

The gas flow is the limiting factor as far as attempts to increase the flow through the still and absorption assembly are concerned: while additional resistance to an increased flow of liquid through the system is practically absent, resistance to the flow of gas increases as the square of gas velocity. Gas flowing through the system will encounter the following obstacles: (1) hydrostatic pressure of the liquid at the plates, which is practically independent of the rate of flow of liquid and (2) friction in the pipes and columns and turbulence arising locally, resistances which increase as the square of gas velocity.

CONFIDENTIAL

CLASSIFICATION CONFIDENTIAL

STATE	X	NAVY	X	NSRB		DISTRIBUTION
ARMY	X	AIR	X	FBI		

The still exerts approximately one half of the resistance of the whole system, which corresponds to a back pressure of 200-280 millimeters of mercury in the still.

Already in 1927-28 a new still having smaller submergence of vapor outlet orifices (about 60 millimeters) and wider vapor outlets (900 millimeters) had been installed at one of the plants. The experiment was successful, but no advantage was taken of the result elsewhere. The increase of the area of outlet orifices and the reduction of the depth of bubbling have their limits, however. A still of the Donetz plant having a great number of conduits or slots (20 instead of 13) and a slot submergence approaching zero did not distill ammonia efficiently and used too much steam. This necessitated alterations comprising a reduction of the number of vapor outlets and an increase of their submergence by 30-50 millimeters.

In order to reduce the resistance to gas flow in the reheater, replacement of reheaters of the bubble plate column type with scrubbers is being attempted. Carbon dioxide is distilled less efficiently in columns of the scrubber type, however. The condensers and coolers of the reheaters do not impede the flow of gas to an appreciable extent and may be disregarded in this instance.

As far as the absorption and washing equipment are concerned, it must be noted that the brine absorbs ammonia with extreme facility -- consequently any type of equipment can be used. With purified brine scrubber type absorbers can be used successfully, although in practice scrubbers are used chiefly for washing out residual ammonia from gases, i.e., as washers. Abroad the practice of using spray type absorbers and scrubber type washers has been introduced.

The spray absorber is in many respects similar to the absorber-cooler installed at Donsoda (ABM-CD). The latter consists of two sections: an upper scrubber section and a lower section equipped with horizontal pipes through which the cooling water circulates. Both gas and liquid flow from top to bottom. In the scrubber section absorption of ammonia takes place under evolution of heat, while in the lower section the solution is cooled very effectively due to the increased temperature gradient. Resistance to gas flow is very low -- much lower than that in a column of the usual scrubber type.

Spray type absorbers have also distinct drawbacks, among which the following may be listed:

1. The difficulty of cleaning cooling surfaces. Frequent replacements of tubes is necessary.

2. In view of the fact that the volume of liquid in the tower is low, the material balance (i.e., the resulting concentration of ammonia in the liquid) is more easily upset than in a bubble type absorber. In other words, greater fluctuations of ammonia concentration occur.

3. Construction of a spray absorber is more complicated and the resulting cost is higher than that of any other absorber.

4. The height of the absorber is greater than that of a bubble type absorber, so that replacement in old installations is difficult.

Additional advantages of the spray type scrubbers comprise straight flow and monophase operation. Straight flow means that liquid entering the absorber does not have to be pumped anywhere else until it has been completely saturated with ammonia. By monophase operation is meant the condition that only one unit instead of several is used for the operation. Both monophase operation and straight flow can be also achieved with a bubble plate type absorber, however.

It follows from the above that spray type absorbers can be recommended for new plants which have been designed for the conversion of purified brine.

The flow of a definite quantity of gas through the equipment is brought about by the differential between the vapor pressure in the lowest section of the still and the vapor pressure in the highest section of the washer. The vapor pressure at the bottom of the still is created by steam entering the still from steam compressors or turbines. Normally this pressure is adequate. If the productivity of the plant is to be increased, steam of a higher pressure will have to be supplied to the still. A higher rate of production will lower the pressure of the steam coming from compressors and turbines, however.

In view of the fact that it is difficult to increase the steam pressure in the still, a higher degree of evacuation at the top of the absorber (washer), implying a higher rate of operation of the vacuum pump, must be resorted to.

Another solution would be replacement of the equipment by new equipment having a lower resistance to gas flow and the use of fewer and shorter connections.

The lower resistance of the equipment at newly constructed plants can be utilized either in order to increase production or in order to effect economies of steam by lowering the pressure of the steam supplied to the still. At present an increase of soda production is more important than economies achieved by the saving of steam.

A drop in the steam pressure can be observed at any of our soda plants as soon as the production load has been reduced.

In addition to the considerations outlined above, the following points may be brought out. The practice of conducting gas from the still to the reheater over the "preleymer" cannot be justified from any point of view. If there is a danger of contamination of the bottom section of the reheater with material precipitated in the still, the same precipitated material may also clog tubes connecting the several pieces of equipment. Spray type absorbers can be installed at new plants if the absorbers are equipped with tubes of good quality and continuous and uninterrupted operation of the plants is assured. Unless these two conditions are satisfied, the use of spray absorbers will only lead to higher production losses. Use of by-product steam from standard turbines for the distillation will lower the production rate if compressors or special turbines supplying high-pressure steam are replaced by standard turbines as a source of steam. In order to maintain the production rate with standard turbines, the number of units must be increased. Knowing the hydrostatic pressure and the resistance to gas flow in any unit, one can easily determine the productivity of that unit on the basis of the conditions which exist at some particular plant.

- E N D -

Sanitized Copy Approved for Release 2011/09/29 : CIA-RDP80-00809A000600290109-9